UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

August 14, 2002

Mr. David M. Campbell
Bitterroot National Forest
6735 West Fork Rd.
Darby, Montana 59829

Re: Biological Opinion and Essential Fish Habitat Consultation for the Gabe Creek and Pete Creek Culvert Replacements (Two Projects)

Dear Mr. Campbell:

This document transmits the National Marine Fisheries Service's (NOAA Fisheries) biological opinion (Opinion) for the proposed Gabe Creek and Pete Creek Culvert Replacements. This Opinion is based on NOAA Fisheries' review of the proposed project and its effects on Snake River steelhead (*Oncorhynchus mykiss*) and its habitat, in accordance with the Endangered Species Act (ESA), and its effects on Essential Fish Habitat (EFH) for chinook salmon (*Oncorhynchus tshawytscha*), in accordance with the Magnuson-Stevens Act (MSA). Spring/summer chinook salmon in the Clearwater River and its tributaries are not part of the Snake River spring/summer chinook salmon ESU listed under the ESA. Formal ESA consultation was conducted under the authority of section 7(a)(2) of the ESA and its implementing regulations, 50 CFR Part 402. The EFH consultation was conducted under the authority of section 305 (b)(2) of the MSA and its implementing regulations, 50 CFR Part 600.

The Bitterroot National Forest determined in the April 16, 2002, Gabe Creek and Pete Creek Culvert Replacements biological assessment (BA) that the proposed actions are likely to adversely affect listed Snake River steelhead or its habitat, and may adversely affect EFH for chinook salmon. This Opinion is based on information in the BA. The enclosed document includes analysis supporting NOAA Fisheries section 7 determination, an incidental take statement, and EFH consultation for the proposed actions. Pursuant to ESA consultation, NOAA Fisheries concludes that the proposed actions are not likely to jeopardize the continued existence of Snake River steelhead. Pursuant to EFH consultation, NOAA Fisheries concludes that the proposed actions may adversely affect EFH for chinook salmon.

This Opinion includes reasonable and prudent measures (RPM) to avoid or minimize take, and mandatory terms and conditions to implement those measures. The RPM also serve as EFH conservation recommendations for the proposed action. Because the EFH consultation includes conservation recommendations, the MSA requires a written response from the action agency, describing how the conservation recommendations will be addressed (section 305(b)(4)(b) of the MSA). However, the requirement for a written response is satisfied by the ESA requirements because the conservation recommendations are fully explained in the Opinion, and they are mandatory actions under the ESA terms and conditions of the Opinion.

Mr. Dale Brege or Mr. David Morgan at (208) 983-3859 are the NOAA Fisheries contacts for this consultation.

Sincerely,

Russell M Strach for

D. Robert Lohn
Regional Administrator

Enclosure

cc: B. Ruesink - USFWS
J. Hanson - IDFG
I. Jones - NPT

Endangered Species Act
Section 7 Consultation Biological Opinion
and
Magnuson-Stevens Act
Essential Fish Habitat Consultation

Gabe Creek and Pete Creek Culvert Replacements
Selway River
Idaho County, Idaho

Agency: Bitterroot National Forest

Consultation Conducted By: National Marine Fisheries Service, (NOAA Fisheries)
Northwest Region

Date Issued: August 14, 2002

Issued by: Russell M Strach for

D. Robert Lohn
Regional Administrator

Refer to: F/NWR/2002/00382

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I. INTRODUCTION

The Bitterroot National Forest (BNF) proposes to replace two culverts, one in Gabe Creek and the other in Pete Creek, both tributaries of Deep Creek, in the Selway River drainage. The purpose is to accommodate 100-year flood flows and eliminate partial fish passage barriers created by existing culverts. Elimination of the passage barriers would restore unrestricted access to an additional 6 miles of potential spawning and rearing habitat for Snake River steelhead (approximately 3 miles in each stream). The BNF is proposing the actions according to its authority under the Organic Act of 1897, Multiple-Use Sustained Yield Act of 1960, and National Forest Management Act of 1976.

A. Background and Consultation History

The BNF initiated Endangered Species Act (ESA) consultation on the proposed Gabe Creek and Pete Creek culvert replacements in a letter dated April 12, 2002, and received by National Marine Fisheries Service (NOAA Fisheries) on April 16, 2002. The BNF also provided a biological assessment (BA) for the proposed actions on April 16, 2002, which concluded that the proposed actions are likely to adversely affect Snake River steelhead and may affect Essential Fish Habitat (EFH) for chinook salmon. Gabe Creek and Pete Creek are tributaries to Deep Creek, which flows into the upper Selway River near the Magruder Guard Station at river mile 81. Gabe Creek and Pete Creek enter Deep Creek 3 and 9 miles above the Selway River, respectively.

B. Proposed Actions

Proposed actions are defined by NOAA Fisheries regulations (50 CFR 402.02) as “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas.” Because the BNF will implement the actions, a Federal nexus exists for interagency consultation under the ESA section 7(a)(2). The culvert replacements would occur in the Selway River drainage (Hydrologic Unit Code 1706010301).

The proposed actions would replace two existing culverts, one each at Gabe Creek and Pete Creek, between July 1, and August 30, 2002[1]. Timing is intended to coincide with low flows to minimize sedimentation and disruption to fish, and to avoid impacting Deep Creek by two projects at once. The stream channels will be dewatered during culvert replacement. Straw bale sediment traps will be constructed below the outlets to contain sediment within the replacement site. A material called “sedimat” will be used to minimize sediment deposition on the stream bottom below the new culverts. Following culvert replacement, areas of disturbed soil will be seeded with grass and straw mulch, and the road beds will be resurfaced. Culvert replacement

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[1] The work window proposed by the BNF was July 1, to August 15. The work window was extended by NOAA Fisheries to allow sufficient time to complete the action.

includes the following activities: (1) excavation of the road fill to uncover the existing culvert and construct a temporary diversion ditch; (2) installation of a temporary coffer dam to divert water into the ditch; (3) removal of the existing culvert; (4) reshaping the original channel while the water is diverted; (5) installation of the new culvert; (6) replacement of the fill material; (7) covering the bottom surface with native material (or allowing the material to fill on its own); (8) removal of the coffer dam; and (9) revegetating disturbed areas. The proposed activities are described in further detail in the BA (USFS 2002).

The new culverts are designed to accommodate a 100-year flood event and to eliminate the existing fish passage barriers. The present culverts at these two road crossings are the only man-made fish passage barriers known to occur in the BNF portion of the upper Selway River subbasin. The culverts partially block fish passage due to high velocities in the Gabe Creek culvert, and a 2 foot jump at the outlet of the Pete Creek culvert. New culverts will be squash-pipe (semi-round) corrugated metal culverts at least 60 inches in diameter, countersunk to allow native streambed material to deposit at the bottom, and positioned to eliminate perched outlets. Additional measures will be taken to maintain the natural streambed slope and to encourage the retention of native streambed material within the culvert.

II. ENDANGERED SPECIES ACT

The ESA of 1973 (16 USC 1531-1544), as amended, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service and NOAA Fisheries, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. This biological opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and its implementing regulations found at 50 CFR 402.

A. Biological Opinion

The objective of this Opinion is to determine whether the proposed Gabe Creek and Pete Creek culvert replacements are likely to jeopardize the continued existence of Snake River steelhead. Spring/summer chinook salmon are also affected by the proposed action, but spring/summer chinook salmon in the Clearwater River and its tributaries are not part of the listed Snake River spring/summer chinook salmon ESU (57 FR 14653). Consequently, the effects of the action on spring/summer chinook salmon are not evaluated under the ESA in this Opinion.

1. Action Area

An action area is defined by NOAA Fisheries regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Areas affected by the culvert replacements include: the immediate area surrounding the culverts, where stream channels and riparian areas are disturbed by excavation or filling; stream reaches downstream from replacement sites, where fine sediment may be carried as bedload or in suspension; and all upstream portions of the drainages accessible to steelhead, where fish passage would be improved. The action area for the proposed projects includes the affected areas described above - Gabe Creek and Pete Creek drainages, upstream from the existing culverts, the mainstem of the Gabe Creek and Pete Creek channels, from the upstream edge of the culverts to their confluence with Deep Creek, and the mainstem of Deep Creek, from the confluence with Gabe and Pete Creeks, extending 300 yards downstream at each location. The Gabe Creek culvert is located at its confluence with Deep Creek. The Pete Creek culvert is located approximately 75 feet above Deep Creek.

2. Biological Information

The proposed Gabe Creek and Pete Creek culvert replacements may affect ESA-listed Snake River steelhead. Snake River steelhead were listed as threatened on August 18, 1997 (62 FR 43937), and protective regulations were established on July 10, 2000, (65 FR 42422). The Snake River steelhead evolutionary significant unit (ESU) includes all remaining natural-origin populations of steelhead in the Snake River basin.

The action area includes spawning and rearing habitat for steelhead. Based on life history timing of this ESU, it is likely that juvenile steelhead, and possibly incubating eggs or alevins, located downstream, would be affected by the proposed culvert replacements. Adult steelhead bound for the Selway drainage usually appear in the Clearwater River basin in September or October, having entered the Columbia River estuary any time from May through October (Fulton 1970). Most steelhead remain in salt water for one to four years, with both age and length at maturity at least partially dependent on length of ocean residence (Withler 1966; Mallett 1974). Fecundity is positively related to fish length and may be genetically and environmentally influenced (Mullan et al. 1992). Sex ratios are usually about 1:1, but this may be affected by male residualism (Mullan et al. 1992). Most adults hold in the mainstem Clearwater and Middle Fork Clearwater Rivers throughout the fall and winter and ascend smaller rivers and tributaries in March and April for spawning. Adult steelhead have been sighted in the mainstem Selway River in the late fall and winter, and it is likely that adults overwinter in the Selway River.

Spawning generally occurs in April and May, depending on temperature, elevation, and water flows, typically on a rising hydrograph and prior to peak streamflow (Thurow 1987). A dominant male usually pairs with a female, although several other males, most notably precocial "jacks", may spawn with a single female. Fry emerge from the gravel in July and rear in streams for 2 to 3 years before migrating to the ocean as smolts. Adult steelhead and smolts are unlikely to be present in Gabe and Pete Creeks from July 1 to August 30, consequently the habitat modifications would have little effect on those life stages.

Stock status for Snake River steelhead is discussed in Attachment A. In summary, the abundance of natural-origin Snake River steelhead counted at the uppermost dam on the Snake River has declined from a 4-year average of 58,300 in 1964 to a 4-year average of 8,300 ending in 1998. Steelhead abundance declined sharply in the early 1970s, increased modestly from the mid-1970s through the 1980s, and declined again during the 1990s. Actual counts or estimates of adult steelhead returning to the Selway River basin are not available. Redd counts and estimates of parr and smolt densities at index areas (discussed in Attachment A) generally indicate that fish production is well below potential, and continuing to decline.

NOAA Fisheries estimates that the average population growth rate (lambda) for the Snake River steelhead ESU as a whole, from 1980 to 1999, ranges from 0.90 to 0.18, assuming that the growth rate decreases as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (Attachment A, Table A-5a through A-5d). The Snake River ESU consists of two distinct runs (A and B) that differ primarily in the timing of adult returns, length of ocean residence, and size of adults (Busby et al. 1996). NOAA Fisheries estimated the risk of absolute extinction within 24 and 100 years for the A- and B-runs, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years ranges from 0.12 for A-run steelhead to 0.35 for B-run fish (Attachment A, Table A6-a). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 1.00 for both runs (Attachment A, Table A-6d)(McClure et.al., 2000a; McClure et. al., 2000b).

Additional information on the status of Snake River steelhead is described in the steelhead status review by Busby et al. (1996), status review update (BRT 1997), and the draft Clearwater Subbasin Summary (CBFWA 2001).

3. Evaluating the Proposed Actions

The standards for determining jeopardy and adverse modification of critical habitat are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402.02 (consultation regulations). In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations combined with The Habitat Approach (NMFS 1999): (1) consider the status and biological requirements of the species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species, (4) consider cumulative effects; and (5) determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival in the wild. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species or result in the destruction or adverse modification of critical habitat (if critical habitat is designated). If either or both are found, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

Because a final Recovery Plan has not been developed for Snake River steelhead, NOAA Fisheries must ascribe the appropriate significance to actions to the extent available information allows. NOAA Fisheries intends that recovery planning identify areas/stocks that are most critical to species conservation and recovery from which proposed actions can be evaluated for consistency under section 7(a)(2).

a. Biological Requirements in the Action Area

The first step NOAA Fisheries uses when applying ESA section 7(a)(2) to the listed ESUs considered in this Opinion is to define the species' biological requirements within the action area. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species within the action area, NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that is relevant to the determination.

Relevant biological requirements are those necessary for the listed ESUs to survive and recover to naturally reproducing population sizes at which protection under the ESA would become unnecessary. This will occur when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. The interim abundance target (for recovery) in the Selway River drainage is 4900 spawners (NMFS 2002). The number of spawners returning to the Selway River basin at the present time is unknown, however, the number of wild steelhead passing over Lower Granite Dam from 1994 to 2000 ranged from 9,436 to 20,580 fish. If the adults returning to the Selway River basin are approximately 11% of the steelhead that pass over Lower Granite Dam (assuming steelhead disperse among drainages in the same proportion as interim abundance targets in NMFS [2002]), the number of adult spawners returning to the Selway River drainage from 1994 to 2000 was approximately 20% to 45% of the recovery goal of 4900 spawners.

For this consultation, the relevant biological requirements include an appropriate range of channel substrate sizes, adequate water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions (Busby et al. 1996; Spence et al. 1996; 62 FR 43937, August 18, 1997; 65 FR 7764, February 16, 2000). Spawning and egg incubation require clean gravels and an ample supply of cool, well-oxygenated water. Juvenile rearing requires a complex physical environment with ample pools, shade, cover, and food production. Successful juvenile and adult migration requires ample stream flow and velocity, in-channel cover, low water temperatures, and unobstructed passage. Collectively, these features support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and growth and development to adulthood.

b. Environmental Baseline

The environmental baseline includes "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, including the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation and the impacts of state and private actions that are contemporaneous with the consultation in progress" (50 CFR 402.02). In step 2 of NOAA Fisheries' jeopardy analysis the relevance of the environmental baseline in the action area is evaluated in consideration of the species current status. In describing the environmental baseline, NOAA Fisheries emphasizes those particular habitat elements required by listed fish for survival, growth and reproduction, and are affected by the proposed action. The action area is described in section II.A.1. of this document. NOAA Fisheries does not expect other areas of the Selway River watershed to be directly or indirectly affected by the proposed actions.

In general, the environment for salmonids in the Columbia River Basin, including those that migrate past and downstream of the action area, has been dramatically affected by the development and operation of the Federal Columbia River Power System. Forestry, farming, grazing, road construction, hydrosystem development, mining, and urbanization have also radically reduced the quantity and quality of historic habitat conditions in much of the basin. Artificial propagation has been used to replace or supplement natural production of salmonids. The traditional response to declining salmon catches was hatchery construction to produce more fish, thus allowing harvest rates to remain high and further exacerbating the effects of over-fishing on the naturally produced (non-hatchery) runs mixed in the same fisheries.

Changes in salmonid populations are also substantially affected by variation in the freshwater and marine environments. Ocean conditions are a key factor in the productivity of Northwest salmonid populations and appear to have been in a low phase of the cycle for some time and are likely an important contributor to the decline of many stocks. The survival and recovery of these species will depend on their ability to persist through periods of low natural survival. Additional details about these effects can be found in Federal Caucus (2000), NMFS (2000), and OPB (2000).

Steelhead numbers in the Selway River drainage, including the project area, are dramatically reduced from historic levels due to extensive alteration of fish habitat from past logging, roads, diversions, grazing, and other downstream problems common to all Columbia River salmon and steelhead. The trend of the steelhead population in the Selway subbasin is unknown, but counts of adult fish in the Selway Falls fishway suggest broad annual fluctuations with an overall gradual decline (IDFG unpublished data 1998, as cited by USFS 1999).

The Selway River (including the project area) was identified as a Priority Watershed through NOAA Fisheries' 1998 biological opinion on the U.S. Forest Service (USFS) Land and Resource Management Plans (LRMPs), as amended by PACFISH[2]. Special LRMP direction for Priority Watersheds is intended to protect important population strongholds and important habitats of anadromous fish, and prioritize these areas for restoration. For the Selway River population of steelhead, the most prevalent limiting factor is probably downstream mortality associated with dams and altered river conditions. The Selway subbasin, 95% of which is wilderness or inventoried roadless, supports intact, accessible spawning and rearing habitat of exceptional quality (USFS 2002). Further, steelhead in the Selway subbasin have not been supplemented with hatchery fish; therefore, the genetic integrity of this population has been maintained. Fishing for adult steelhead in the Selway River is not legal under current Idaho Department of Fish and Game fishing regulations, but incidental and illegal take of adults downstream in the mainstem Clearwater River probably occurs as well as legal harvest of juvenile steelhead in tributaries to the Selway River. Harvest of Selway River steelhead trout in the ocean and in-river gill nets in the Columbia River also occurs (USFS 1999).

Of the habitat components affecting steelhead rearing in the Selway River, mainstem river temperature in the summer months may be the most limiting factor. Some tributaries have elevated levels of deposited sediment from both natural and human-caused events. Chronic sediment inputs above natural levels may limit steelhead production in O'hara, Goddard, Elk City, Falls, and Deep Creeks. These effects are primarily the result of permanent roads (USFS 1999).

The Selway River drainage is considered a refugia for steelhead due to its high-quality habitat, and high proportion of roadless/wilderness areas that lack chronic sediment-producing features such as roads. Although this drainage is prone to natural pulses of sediment, there is a sufficient number of tributaries tributaries to function as refugia in the event that other streams are impacted by natural events such as floods, landslides, and fire. In the Selway subbasin, all streams with sufficient size and gradient that are accessible to fish in the mainstem river support steelhead juvenile rearing or spawning or both. Elevated sediment deposition may have lowered the carrying capacity for juvenile rearing and the quantity and quality of spawning habitat in streams with high road densities (USFS 1999).

In the project area, steelhead spawn in Deep Creek (a 5th order stream), and juveniles inhabit Pete Creek (3rd order) and Gabe Creek (2nd order). The mainstem of Deep Creek contains about 14 miles of suitable fish-bearing habitat, with at least another 10 miles in its primary tributaries of Cayuse, Slow Gulch, Vance, Gabe, and Pete Creeks (USFS 2002).

Steelhead habitat conditions in the action area have few human impacts, with the most significant degradation occurring from impassable culverts and effects of the Magruder Corridor Road (Forest Service Road 468). The vast majority of the Deep Creek drainage is designated

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[2] Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and California

wilderness (Selway-Bitterroot Wilderness Area on the north side of Deep Creek; Frank Church River of No Return Wilderness Area on the south side of the creek). The two wilderness areas are separated by the Magruder Corridor Road, which closely parallels Deep Creek for most of its 16 miles between Nez Perce Pass and the Selway River. The Magruder Corridor Road crosses Pete Creek and Gabe Creek just upstream from their respective confluences with Deep Creek. This road impairs several habitat elements along Deep Creek, including riparian vegetation, width to depth ratio, streambank stability, water temperature, physical barriers, cobble embeddedness, percent surface fines, large woody debris, pool frequency, and off-channel habitat (USFS 2002).

The biological requirements of the Snake River steelhead ESU, as a whole, are not met under the existing condition in the Snake River basin. However, the environmental baseline in the action provides for most biological requirements of Snake River steelhead, and has little room for improvement beyond reducing effects of the Magruder Corridor Road.

4. Analysis of Effects of Proposed Actions

Effects of the action are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR 402.02). Direct effects occur at the project site and may extend upstream or downstream depending on the nature of the effect. Indirect effects are defined in 50 CFR 402.02 as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur." Indirect effects include effects of future activities on listed fish or fish habitat that are induced by the proposed action, but occur after the action is completed. "Interrelated actions are those that are part of a larger action and depend on the larger action for their justification." Interdependent actions have no independent utility apart from the action under consideration (50 CFR 402.02), and would not occur if not for the proposed action..

a. Effects of Proposed Actions

NOAA Fisheries determines if actions jeopardize listed steelhead by evaluating the effects of proposed actions in the context of the status of the species and its habitat. To avoid jeopardy, proposed actions generally must cause no more than minimal amounts of incidental take of the species, and also must restore, maintain, or at least not appreciably interfere with the recovery of the properly functioning condition of the various fish habitat elements in the action area.

The BA provides a detailed analysis of the effects of the proposed actions on Snake River steelhead in the action area. The analysis is centered on application of NOAA Fisheries' matrices for the upper Selway River subbasin - Deep Creek (Hydrololgic Unit Code 1760603010602). In reviewing this information and accompanying narratives in the BA, NOAA Fisheries focuses particularly on those elements of the proposed action that potentially affect steelhead or their habitat.

Flow diversions, and excavation and replacement of road fills and stream channel materials are likely to temporarily increase stream turbidity and sedimentation, and rearrange substrate materials. Each culvert replacement will produce approximately 1.5 to 2 tons of sediment, nearly all of which is expected to be deposited within 30 hours and 150 feet of the two culverts, immediately following replacement, based on results from previous culvert replacement projects on the Bitterroot, Flathead, and Lolo National Forests (USFS 2002). The sediment deposited below the culverts after 30 hours would be redistributed downstream, over a larger area during the first major flow event following culvert replacement.

To minimize the duration of sediment delivery, disturbed areas will be seeded with grass and covered with straw mulch. Nonetheless, the sediment plume and increase in stream turbidity could temporarily diminish feeding downstream. This effect is expected to be minimal since the duration and extent of turbid flows are likely to be short-lived and localized. Turbidity would be created only briefly when water is first routed into the bypass channel and when put back into the original channel at the end of the project, and from occasional spillage of soils during excavation and filling. Sedimentation could potentially degrade spawning habitat downstream from the culverts, but due to an abundance of riffles, cobbles, and boulders in the area, good spawning habitat is not available within several hundred feet downstream of the two culvert sites. Sedimentation could reduce interstitial space and overwintering habitat, but the volume of sediment produced, and the area affected, by the proposed actions are expected to be small.

The July 1 to August 30 operating window coincides with low flows, which minimize the amount of sediment created by the action, and avoids disruption of redds or adult steelhead migrations. Nevertheless, there remains the possibility that the proposed action could harm or kill juvenile steelhead by stranding fish in the diversion ditch or original channel, or injure them when installing or removing the cofferdam. Direct mortality is expected to be low because juvenile fish, having already emerged from substrate interstices by this time of year, are likely to move away from the project work area before they would become susceptible to injury.

Several long-term beneficial effects are expected. Hydrologic function will be improved by reducing the probability of culvert failures and by re-establishing more natural patterns of bedload movement. Restored hydrologic functions will accommodate natural migration patterns of aquatic organisms, including juvenile Snake River steelhead, that are presently blocked from upstream passage. Eliminating the two culvert barriers would open up year-round access to an additional six miles of potential spawning and rearing habitat (approximately 3 miles each in Gabe Creek and Pete Creek).

No interrelated or interdependent actions or effects are associated with the proposed actions. Based on the effects described above, the proposed actions will have a short-term negative effect and a long-term positive effect on the population trend of Snake River steelhead.

b. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." Other activities within the watershed have the potential to impact fish and habitat within the action area. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being reviewed through separate section 7 consultation processes. Past Federal actions have already been added to the environmental baseline in the action area.

Virtually all of the upper Selway basin is Federal land managed by the USFS, therefore, most future actions in the action area will be subject to section 7 consultation. There are no known future state, tribal, or private actions that are reasonably certain to occur in the action area.

5. Conclusion

NOAA Fisheries has determined that, when the effects of the proposed action are added to the environmental baseline and cumulative effects occurring in the action area given the status of the stocks and habitat conditions, the actions are not likely to jeopardize the continued existence of the listed ESU considered in this Opinion.

This conclusion was based on the following considerations: (1) The proposed actions are not likely to retard the long-term progress of impaired habitat toward Proper Functioning Conditions (PFC); (2) the proposed actions would not appreciably reduce survival of ESA-listed species; (3) the proposed actions will result in no more than minor, localized, short-term adverse effects; and (4) the proposed actions will result in long-term restoration of fish passage and hydrologic processes in Gabe and Pete Creeks. In reaching these determinations, NOAA Fisheries used the best scientific and commercial data available.

6. Conservation Recommendations

Conservation recommendations are defined as suggestions of NOAA Fisheries “regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information" (50 CFR 402.02). Section 7 (a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. NOAA Fisheries does not request any conservation recommendations for these actions.

7. Reinitiation of Consultation

This concludes formal ESA consultation on the Gabe Creek and Pete Creek culvert replacements described in the BA submitted April 12, 2002. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the actions may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

B. Incidental Take Statement

Sections 4 (d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined in 50 C.F.R. 222.102 as "an act that may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering." Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. Incidental take is take of listed species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures (RPM) that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the RPM.

1. Amount or Extent of Take

The proposed actions are reasonably certain to result in incidental take of Snake River steelhead. NOAA Fisheries is reasonably certain the incidental take described here will occur because: (1) snorkel monitoring data (USFS 2002) indicates a density of 2.33 steelhead per 100 square meters in the vicinity of the culverts; and (2) listed fish may be harmed or killed from stranding fish in the dewatered stream channels or temporary diversion ditches, or injured when installing or removing the temporary coffer dams.

The extent of take from instream work at each site includes the stream channel beginning 20 feet upstream from the coffer dam, and extending downstream to the point where the temporary diversion ditch rejoins the stream channel (approximately 66 and 75 feet in Gabe and Pete Creeks, respectively). The number of fish directly killed or injured is expected to be low because fish typically disperse when disturbed by people or equipment.

2. Reasonable and Prudent Measures

The RPM are non-discretionary measures to minimize take, that are not already part of the description of the proposed action. They must be implemented as binding conditions for the exemption in section 7(a)(2) to apply. The BNF has the continuing duty to regulate the activities covered in this incidental take statement. If the BNF fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. NOAA Fisheries believes that activities carried out in a manner consistent with these RPM, except those otherwise identified, will not necessitate further site-specific consultation. Activities which do not comply with all relevant RPM will require further consultation.

NOAA Fisheries believes the following RPM are necessary and appropriate to minimize take of listed fish resulting from implementation of the actions. These RPM would also minimize adverse effects on steelhead habitat.

a. The BNF shall implement Best Management Practices (BMPs) to minimize negative impacts in the riparian area and stream channel.

b. The BNF shall avoid or minimize take from instream work by excluding fish from instream work areas and avoiding spawning areas.

c. The BNF shall avoid or minimize risk of chemical contamination from fuels or lubricants.

3. Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the BNF must comply with the following terms and conditions, which implement the RPM described above for each category of activity. These terms and conditions are non-discretionary.

a. To implement RPM #1, above, the BNF shall:

(1) Review and approve designs and plans of operation for any activity implemented through private contract to ensure proper design criteria, BMPs, Forest Plan standards, and ESA requirements are met.

(2) Use oversized, squash-shaped culverts to be large enough to pass the 100-year flood. Sink the culvert bottoms into the stream bed to a depth of 1 to 2 feet. The grade of the culverts will match the natural grade of the channel, which is about three percent, as closely as possible. Cover the culvert bottoms with 1 to 2 foot diameter rock, prior to running the water back through the new pipe, to help to hold the native material together in the bottom.

(3) Divert live water around the work site using a clean water diversion consisting of a lined ditch, coffer dam, pumps, and/or flexible pipes.

(4) Construct straw bale sediment traps below the outlets to contain sediment from the replacement site and use "sedimat"material to minimize sediment deposition on the stream bottom below the new culverts.

(5) Minimize erosion and sedimentation on disturbed areas through use of weed free straw mulch, placement of woody debris or slash, application of seed (annual and native seed species), or planting shrubs and forbs. Utilize only seed mixes and vegetation species approved for use on the BNF. Complete seeding and mulching of disturbed areas as soon as possible following work activities.

b. To implement RPM #2, above, the BNF shall:

(1) Have a fishery biologist conduct visual surveys to ensure that there are no redds or adult fish in the vicinity of the action area prior to scheduling in stream work. Work shall cease if redds are detected in the vicinity of in stream activities, and actions shall be modified in consultation with NOAA Fisheries to avoid harm or harassment.

(2) Conduct activities between July 1 and August 30, to avoid sediment deposition on emerging steelhead or chinook redds. These dates may be site-specifically adjusted with Level 1 ESA consultation group review and approval.

(3) De-water culverts prior to replacement.

c. To implement RPM #3, above, the BNF shall:

(1) Not allow fuel storage and/or refueling of equipment within streamside Riparian Habitat Conservation Areas.

(2) Inspect all heavy equipment or other machinery for hydraulic or other leaks. Leaking or faulty equipment will not be used. Equipment with accumulations of oil, grease, or other toxic materials will be cleaned prior to use in these areas.

If a dead, injured, or sick listed species specimen is found, initial notification must be made to the National Marine Fisheries Service Law Enforcement Office, in the Vancouver Field Office, 600 Maritime, Suite 130, Vancouver, Washington 98661; or call: (360) 418-4246. Care should be taken in handling sick or injured specimens to ensure effective treatment and care. Dead specimens should be handled to preserve biological material in the best possible state for later analysis of cause of death. With the care of sick or injured listed species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed.

III. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

A. Background

The objective of EFH consultation is to determine whether the proposed actions may adversely affect designated EFH for relevant species, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed actions.

B. Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

The EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of essential fish habitat: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA Fisheries, provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

C. Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for Federally-managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years) (PFMC 1999) In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH for the groundfish species are found in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998a) and the NOAA Fisheries Essential Fish Habitat for West Coast Groundfish Appendix (Casillas *et al.* 1998). Detailed descriptions and identifications of EFH for the coastal pelagic species are found in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998b). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the potential adverse effects to these species' EFH from the proposed actions are based on this information.

D. Proposed Actions

The proposed actions are detailed above in section I.B. The action area includes habitat located on Gabe Creek and Pete Creek near their confluence with Deep Creek in the upper Selway River subbasin at approximately river mile 81. This area has been designated as EFH for various life stages of chinook salmon.

E. Effects of Proposed Actions

Chinook salmon spawn and rear in Deep Creek, but are present at very low densities (0.14 fish per 100 sq. meters). Chinook salmon have not been observed in Gabe or Pete Creeks. Tributary streams such as Gabe Creek and Pete Creek are likely to be too steep and too small for chinook salmon spawning.

Turbidity and sediment deposition that occur from the action are likely to temporarily displace any juvenile salmon within 150 feet downstream from the culverts, based on observations of sediment deposition and turbidity plumes observed during similar activities. The proposed action is not expected to have a significant effect on chinook salmon spawning or rearing. Small pockets of marginal spawning habitat for chinook salmon are present immediately downstream from the mouths of Gabe and Pete Creeks, however, suitable spawning habitat that is likely to be used by chinook salmon is several hundred feet downstream from each site.

As described in detail in section II.A.3, the proposed activities may result in detrimental short- and long-term adverse effects to a variety of habitat parameters. These habitat impacts include temporary water diversion, temporary increase in sediment and turbidity, and temporary displacement of juvenile fish. In the long-term, the action would restore access to Gabe and Pete Creeks by juvenile chinook salmon.

F. Conclusion

NOAA Fisheries believes that the proposed actions may adversely affect EFH for Pacific salmon species.

G. EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that may adversely affect EFH. All RPM and the Terms and Conditions contained in sections II B.2 and II.B.3, respectively, are applicable to EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH recommendations.

H. Statutory Response Requirement

Please note that the MSA (section 305(b)) and 50 CFR 600.920(j) requires the Federal agency to provide a written response to NOAA Fisheries after receiving EFH conservation recommendations within 30 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the adverse impacts of the activity on EFH. If the response is inconsistent with a conservation recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

The requirement for a written response is satisfied by the ESA terms and conditions of the Opinion, which are identical to the MSA conservation recommendations. The conservation recommendations are fully explained in the Opinion, and they are mandatory actions under the ESA. Consequently, no written response is required for the proposed culvert replacements.

I. Consultation Renewal

The BNF must reinitiate EFH consultation with NOAA Fisheries if either action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

IV. REFERENCES

Section 7(a)(2) of the ESA requires biological opinions to be based on "the best scientific and commercial data available." This section identifies the data used in developing this Opinion in addition to the BA and additional information requested by NMFS and provided by the Bitterroot National Forest.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27. August.

BRT (West Coast Steelhead Biological review Team). 1997. Status review update for West Coast Steelhead from Washington, Oregon, Idaho and California. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

Casillas, E., L. Crocket, Y. deReynier, J. Glock, M. Helvey, B.Meyer, C. Schmidt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson and T. Pepperell. 1998. Essential Fish Habitat West Coast Groundfish Appendix. National Marine Fisheries Service. Seattle, Washington. 778 p.

CBFWA (Columbia Basin Fish and Wildlife Authority). 2001. Draft Clearwater Subbasin Summary, prepared for the Northwest Power Planning Council. <http://www.cbfwa.org/files/province/mtnsnake

Federal Caucus. 2000. Conservation of Columbia basin fish: final basinwide salmon recovery strategy. <http://www.salmonrecovery.gov> December.

Fulton, L.A. 1970. Spawning and abundance of steelhead trout and coho salmon, sockeye, and chum salmon in the Columbia River basin - past and present. NOAA SSRF-618. U.S. Department of Commerce, National Oceanic Atmospheric Administration, National Marine Fisheries Service.

Mallett, J. 1974. Inventory of salmon and steelhead resources, habitat, use, and demands. Job Performance Report. Idaho Department of Fish and Game. Boise, Idaho.

McClure, M., B. Sanderson, E. Holmes, C. Jordan, P. Kareiva, and P. Levin. 2000a. Revised Appendix B of standardized quantitative analysis of the risks faced by salmonids in the Columbia River basin. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington. September.

McClure, M. M., B. L. Sanderson, E. E. Holmes, and C. E. Jordan. 2000b. A large-scale, multi-species risk assessment: anadromous salmonids in the Columbia River basin. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington. Submitted to Ecological Applications.

Mullan, J. W., K. R. Williams, G. Rhodus, T. W. Hillman, and J. D. McIntyre. 1992. Production and habitat of salmonids in mid Columbia River tributary streams. U.S. Fish. Wildl. Serv. Monograph I:1-489.

National Marine Fisheries Service (NMFS). 1999. The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for actions affecting the habitat of Pacific Anadromous Salmonids. Habitat Conservation and Protected Resources Divisions. Portland, Oregon.

NMFS. 2000. Biological Opinion -- Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin. Hydro Program, Portland, Oregon. (Issued December 21, 2000)

NMFS. 2002. Interim Abundance and productivity targets for Interior Columbia salmon and steelhead listed under the Endangered Species Act. April 4, 2002, letter to the Northwest Power Planning Council, National Marine Fisheries Service, Seattle Washington.

OPB (Oregon Progress Board). 2000. Oregon State of the Environment Report 2000. OPB, Salem, Oregon.

Pacific Fisheries Management Council (PFMC). 1998a. Amendment 8 to coastal pelagic species fishery management plan. PFMC, Portland, Oregon. December.

PFMC. 1998b. Final environmental assessment: regulatory review for Amendment 11 to Pacific Coast groundfish fishery management plan. PFMC, Portland, Oregon.

PFMC. 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon.

Spence, B.C., G.A. Lomincky, R.M. Hughes and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Report prepared for the National Marine Fisheries Service, Portland, Oregon. 356 pages.

Thurow, R.F. 1987. Evaluation of the South Fork Salmon River steelhead trout fishery restoration program, lower Snake River fish and wildlife compensation plan, job completion report no. 14-16-0001-86505, Idaho Fish and Game, Boise, Idaho.

USFS (U.S. Forest Service). 1999. Clearwater National Forest Monitoring & Evaluation Report, fiscal year 1998. Clearwater National Forest, Orofino, Idaho.

USFS (U.S. Forest Service). 2002. Biological Assessment for the Gabe Creek and Pete Creek Culvert Replacements. West Fork Ranger District, Bitterroot National Forest, Hamilton, Montana.

Withler, I. L. 1966. Variability in life history characteristics of steelhead trout (Salmo gairdneri) along the Pacific coast of North America. Journal of the Fisheries Research Board of Canada 23:365-393.

Attachment A

BIOLOGICAL REQUIREMENTS, CURRENT STATUS, AND TRENDS:

SNAKE RIVER STEELHEAD

A.1 Status of Snake River Steelhead

The Snake River steelhead Evolutionary Significant Unit (ESU), listed as threatened on August 18, 1997, (62 FR 43937), includes all natural-origin populations of steelhead in the Snake River basin of southeast Washington, northeast Oregon, and Idaho. None of the hatchery stocks in the Snake River basin are listed, but several are included in the ESU. Critical habitat was designated for Snake River steelhead on February 16, 2000, (65 FR 7764).

A.1.2 General Life History

Steelhead can be divided into two basic run-types based on the state of sexual maturity at the time of river entry and the duration of the spawning migration (Burgner et al. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, whereas others only have one run-type.

In the Pacific Northwest, summer steelhead enter fresh water between May and October (Busby et al. 1996; Nickelson et al. 1992). During summer and fall, prior to spawning, they hold in cool, deep pools (Nickelson et al. 1992). They migrate inland toward spawning areas, overwinter in the larger rivers, resume migration in early spring to natal streams, and then spawn (Meehan and Bjornn 1991; Nickelson et al. 1992). Winter steelhead enter fresh water between November and April in the Pacific Northwest (Busby et al. 1996; Nickelson et al. 1992), migrate to spawning areas, and then spawn in late winter or spring. Some adults, however, do not enter coastal streams until spring, just before spawning (Meehan and Bjornn 1991). Difficult field conditions (snowmelt and high stream flows) and the remoteness of spawning grounds contribute to the relative lack of specific information on steelhead spawning.

Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying and most that do so are females (Nickelson et al. 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby et al. 1996). Multiple spawnings for steelhead range from three percent to 20% of runs in Oregon coastal streams.

Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986; Everest 1973). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation. Cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973) are required to reduce disturbance and predation of spawning steelhead. Summer steelhead usually spawn further upstream than winter steelhead (Withler 1966; Behnke 1992).

Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching. Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson et al. 1992).

Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as smolts. Winter steelhead populations generally smolt after 2 years in fresh water (Busby et al. 1996). Steelhead typically reside in marine waters for 2 or 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age. Populations in Oregon and California have higher frequencies of age-1-ocean steelhead than populations to the north, but age-2-ocean steelhead generally remain dominant (Busby et al. 1996). Age structure appears to be similar to other west coast steelhead, dominated by 4-year old spawners (Busby et al. 1996).

Based on purse seine catches, juvenile steelhead tend to migrate directly offshore during their first summer rather than migrating along the coastal belt as do salmon. During fall and winter, juveniles move southward and eastward (Hartt and Dell 1986).

A.1.3 Population Dynamics and Distribution

The following section provides specific information on the distribution and population structure (size, variability, and trends of the stocks or populations) of the Snake River ESU. Most of this information comes from observations made in terminal, freshwater areas, which may be distinct from the action area. This focus is appropriate because the species status and distribution can only be measured at this level of detail as adults return to spawn.

The longest consistent indicator of steelhead abundance in the Snake River basin is based on counts of natural-origin steelhead at the uppermost dam on the lower Snake River. The abundance of natural-origin summer steelhead at the uppermost dam on the Snake River has declined from a 4-year average of 58,300 in 1964 to an average of 8,300 ending in 1998. In general, steelhead abundance declined sharply in the early 1970s, rebuilt modestly from the mid-1970s through the 1980s, and again declined during the 1990s (Figure A-1).

These broad scale trends in the abundance of steelhead were reviewed through the Plan for Analyzing and Testing Hypotheses (PATH) process. The PATH report concluded that the initial, substantial decline coincided with the declining trend in downstream passage survival. However, the more recent decline in abundance, observed over the last decade or more, does not coincide with declining passage survival but can be at least partially be accounted for by a shift in climatic regimes that has affected ocean survival (Marmorek and Peters 1998).

The abundance of A-run versus B-run components of Snake River basin steelhead can be distinguished in data collected since 1985. Both components have declined through the 1990s, but the decline of B-run steelhead has been more significant. The 4-year average counts at Lower Granite Dam declined from 18,700 to 7,400 beginning in 1985 for A-run steelhead and from 5,100 to 900 for B-run steelhead. Counts over the last 5 or 6 years have been stable for A-run steelhead and without significant trend (Figure A-2). Counts for B-run steelhead have been low and highly variable, but also without apparent trend (Figure A-3).

Comparison of recent dam counts with escapement objectives provides perspective regarding the status of the ESU. The management objective for Snake River steelhead stated in the Columbia River Fisheries Management Plan was to return 30,000 natural/wild steelhead to Lower Granite Dam. The All Species Review (TAC 1997) further clarified that this objective was subdivided into 20,000 A-run and 10,000 B-run steelhead. Idaho has reevaluated these escapement objectives using estimates of juvenile production capacity. This alternative methodology lead to revised estimates of 22,000 for A-run and 31,400 for B-run steelhead (pers. comm., S. Keifer, Idaho Department of Fish and Game with P. Dygert, NOAA Fisheries).

The State of Idaho has conducted redd count surveys in all of the major subbasins since 1990. Although the surveys are not intended to quantify adult escapement, they can be used as indicators of relative trends. The sum of redd counts in natural-origin B-run production subbasins declined from 467 in 1990 to 59 in 1998 (Figure A-4). The declines are evident in all four of the primary B-run production areas. Index counts in the natural-origin A-run production areas have not been conducted with enough consistency to permit similar characterization.

Idaho has also conducted surveys for juvenile abundance in index areas throughout the Snake River basin since 1985. Parr densities of A-run steelhead have declined from an average of about 75% of carrying capacity in 1985 to an average of about 35% in recent years through 1995 (Figure A-5) Further declines were observed in 1996 and 1997. Parr densities of B-run steelhead have been low, but relatively stable since 1985, averaging 10% to 15% of carrying capacity through 1995. Parr densities in B-run tributaries declined further in 1996 and 1997 to 11% and eight percent respectively.

Figure A-1. Adult Returns of Wild Summer Steelhead to the Uppermost Dam on the Snake River

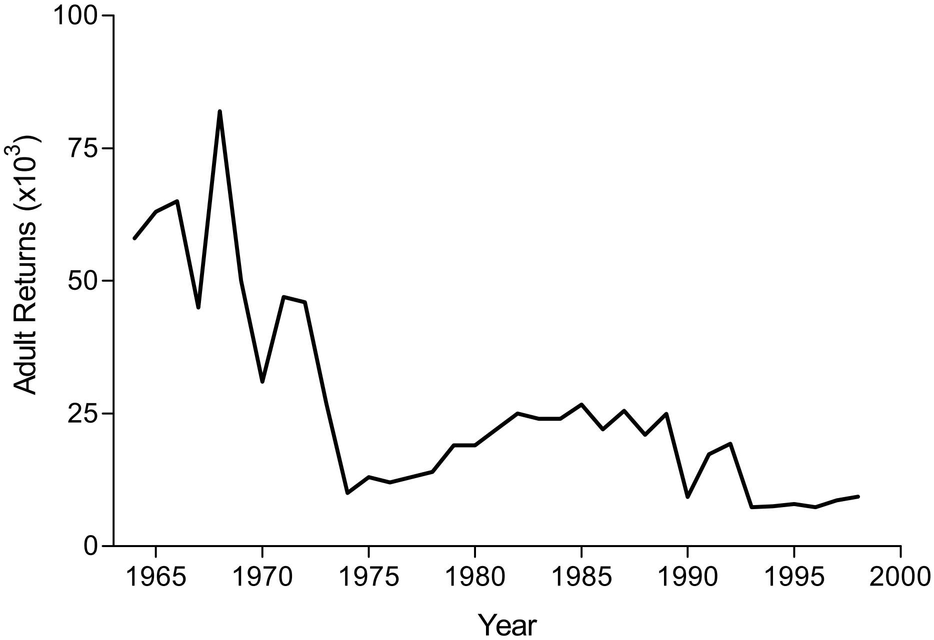
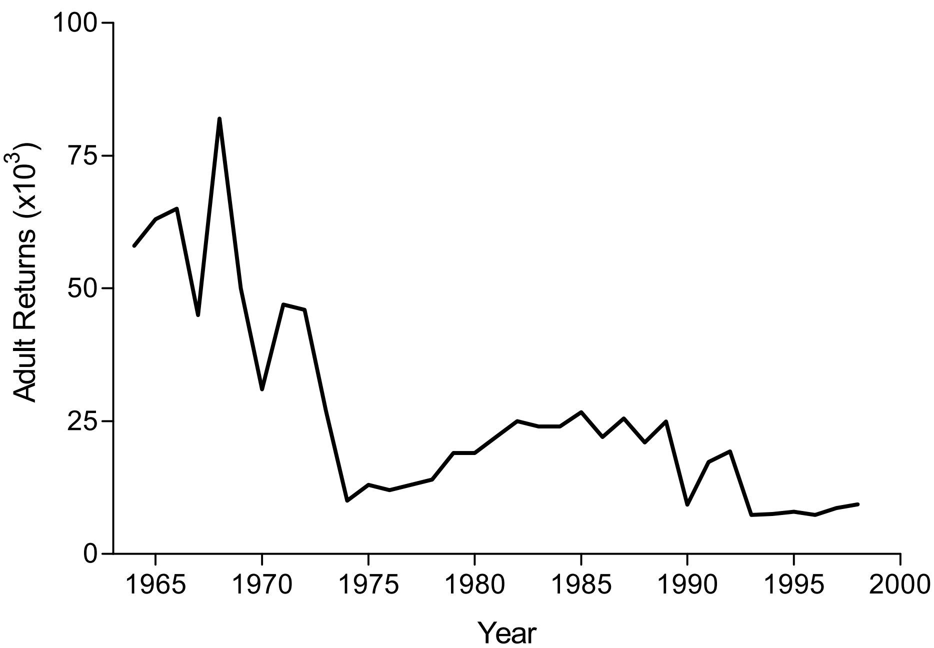


Figure A-2. Escapement of A-Run Snake River Steelhead to the Uppermost Dam1[3]



[3]Source: Data for 1980 through 1984 from Figures 1 and 2 of Section 8 in (TAC 1997). Data for 1985 through 1998 from Table 2 of Section 8 (TAC 1997) and pers. comm. G. Mauser, IDFG.

Figure A-3. Escapement of B-Run Snake River Steelhead to the Uppermost Dam[1]

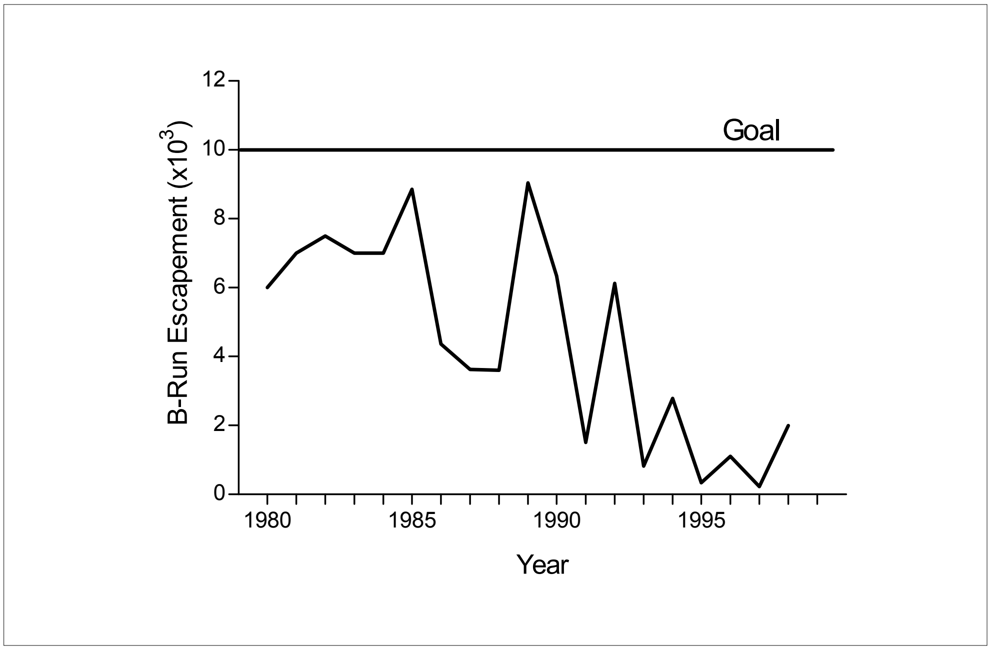
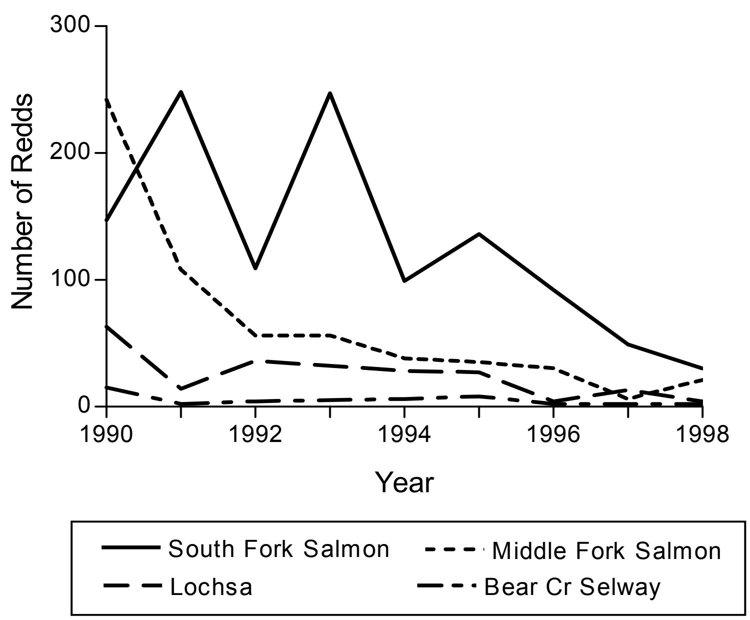


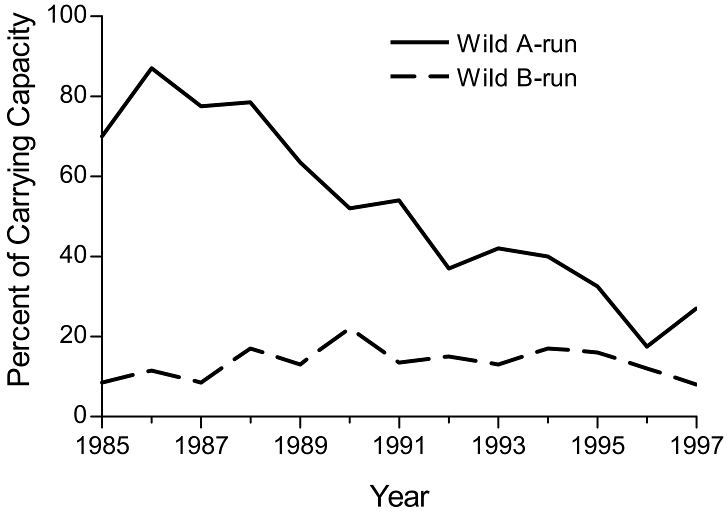
Figure A-4. Redd Counts for Wild Snake River (B-Run) Steelhead in the South Fork and Middle Fork Salmon, Lochsa, and Bear Creek-Selway Index Areas



Data for the Lochsa exclude Fish Creek and Crooked Fork.
Sources: memo from T. Holubetz (IDFG), "1997 Steelhead Redd Counts", dated May 16, 1997, and IDFG, unpubl. data).

[1] Source: Data for 1980 through 1984 from Figures 1 and 2 of Section8 in (TAC 1997). Data for 1985 through 1998 from Table 2 of Section 8 (TAC 1997) and pers. comm. G. Mauser, IDFG.

Figure A-5. Percent of Estimated Carrying Capacity for Juvenile (Age 1+ and 2+) Wild A- and B-Run Steelhead in Idaho Streams



Source: Data for 1985 through 1996 from (Hall-Griswold and Petrosky 1998); data for 1997 from IDFG (unpublished).

It is apparent from the available data that B-run steelhead are much more depressed than the A-run component. In evaluating the status of the Snake Basin steelhead ESU it is pertinent to consider whether B-run steelhead represent a "significant portion" of the ESU. This is particularly relevant because the Tribes have proposed to manage the Snake River basin steelhead ESU as a whole without distinguishing between components and further that it is inconsistent with National Marine Fisheries Service (NOAA Fisheries) authority to manage for components of an ESU.

It is first relevant to put the Snake River basin into context. The Snake River historically supported over 55% of total natural-origin production of steelhead in the Columbia basin and now has approximately 63% of the basin's natural production potential (Mealy 1997). B-run steelhead occupy four major subbasins including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon), areas that for the most part are not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives for B-run steelhead of 10,000 (TAC 1997) and 31,400 (Idaho). B-run steelhead therefore represent at least 1/3 and as much as 3/5 of the production capacity of the ESU.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger and older, later-timed fish that return primarily to the South Fork Salmon, Middle Fork Salmon, Selway, and Lochsa rivers. The recent review by the Technical Advisory Committee (TAC) concluded that different populations of steelhead do have different size structures, with populations dominated by larger fish (i.e., greater than 77.5 cm) occurring in the traditionally defined B-run basins (TAC 1999). Larger fish occur in other populations throughout the basin, but at much lower rates (evidence suggests that fish returning to the Middle Fork Salmon and Little Salmon are intermediate in that they have a more equal distribution of large and small fish).

B-run steelhead are also generally older. A-run steelhead are predominately age-1-ocean fish whereas most B-run steelhead generally spend two or more years in the ocean prior to spawning. The differences in ocean age are primarily responsible for the differences in the size of A- and B-run steelhead. However, B-run steelhead are also thought to be larger at age than A-run fish. This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence at a time when growth rates are thought to be greatest.

Historically, a distinctly bimodal pattern of freshwater entry could be used to distinguish A-run and B-run fish. A-run steelhead were presumed to cross Bonneville Dam from June to late August whereas B-run steelhead enter from late August to October. The TAC reviewed the available information on timing and confirmed that the majority of large fish do still have a later timing at Bonneville; 70% of the larger fish crossed the dam after August 26, the traditional cutoff date for separating A- and B-run fish (TAC 1999). However, the timing of the early part of the A-run has shifted somewhat later, thereby reducing the timing separation that was so apparent in the 1960s and 1970s. The timing of the larger, natural-origin B-run fish has not changed.

As pointed out above, the geographic distribution of B-run steelhead is restricted to particular watersheds within the Snake River basin (areas of the mainstem Clearwater, Selway, and Lochsa Rivers and the South and Middle Forks of the Salmon River). No recent genetic data are available for steelhead populations in South and Middle Forks of the Salmon River. The Dworshak National Fish Hatchery (NFH) stock and natural populations in the Selway and Lochsa Rivers are thus far the most genetically distinct populations of steelhead in the Snake River basin (Waples et al. 1993). In addition, the Selway and Lochsa River populations from the Middle Fork Clearwater appear to be very similar to each other genetically, and naturally produced rainbow trout from the North Fork Clearwater River (above Dworshak Reservoir) clearly show an ancestral genetic similarity to Dworshak NFH steelhead. The existing genetic data, the restricted geographic distribution of B-run steelhead in the Snake (Columbia) River basin, and the unique life history attributes of these fish (i.e. larger, older adults with a later distribution of run timing compared to A-run steelhead in other portions of the Columbia River basin) clearly support the conservation of B-run steelhead as a biologically significant component of the Snake River ESU.

Another approach to assessing the status of an ESU being developed by NOAA Fisheries is to consider the status of its component populations. For this purpose a population is defined as a group of fish of the same species spawning in a particular lake or stream (or portion thereof) at a particular season, which to a substantial degree do not interbreed with fish from any other group spawning in a different place or in a the same place at a different season. Because populations as defined here are relatively isolated, it is biologically meaningful to evaluate the risk of extinction of one population independently from any other. Some ESUs may be comprised of only one population whereas others will be constituted by many. The background and guidelines related to the assessment of the status of populations is described in a recent draft report discussing the concept of Viable Salmonid Populations (McElhany et al. 2000).

The task of identifying populations within an ESU will require making judgements based on the available information. Information regarding the geography, ecology, and genetics of the ESU are relevant to this determination. Although NOAA Fisheries has not compiled and formally reviewed all the available information for this purpose, it is reasonable to conclude that, at a minimum, each of the major subbasins in the ESU represent a population within the context of this discussion. A-run populations would therefore include at least the tributaries to the lower Clearwater, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde, Imnaha, and possibly the Snake mainstem tributaries below Hells Canyon Dam. B-run populations would be identified in the Middle Fork and South Fork Salmon rivers and the Lochsa and Selway rivers (major tributaries of the upper Clearwater), and possibly in the mainstem Clearwater River, as well. These basins are, for the most part, large geographical areas and it is quite possible that there is additional population structure within at least some of these basins. However, because that hypothesis has not been confirmed, NOAA Fisheries assumes that there are at least five populations of A-run steelhead and five populations of B-run steelhead in the Snake River basin ESU. Escapement objectives for A and B-run production areas in Idaho, based on estimates of smolt production capacity, are shown in Table A-1.

Table A-1. Adult Steelhead Escapement Objectives Based on Estimates of 70% Smolt Production Capacity

A-Run Production Areas		B-Run Production Areas	
Upper Salmon	13,570	Mid Fork Salmon	9,800
Lower Salmon	6,300	South Fork Salmon	5,100
Clearwater	2,100	Lochsa	5,000
Grand Ronde	(1)	Selway	7,500
Imnaha	(1)	Clearwater	4,000
Total	**21,970**	**Total**	**31,400**

Note: comparable estimates are not available for populations in Oregon and Washington subbasins.

Hatchery populations, if genetically similar to their natural-origin counterparts, provide a hedge against extinction of the ESU or of the gene pool. The Imnaha and Oxbow hatcheries produce A-run stocks that are currently included in the Snake River basin steelhead ESU. The Pahsimeroi and Wallowa hatchery stocks may also be appropriate and available for use in developing supplementation programs; NOAA Fisheries required in its recent biological opinion on Columbia basin hatchery operations that this program begin to transition to a local-origin broodstock to provide a source for future supplementation efforts in the lower Salmon River (NMFS 1999). Although other stocks provide more immediate opportunities to initiate supplementation programs within some subbasins, it may also be necessary and desirable to develop additional broodstocks that can be used for supplementation in other natural production areas. Despite uncertainties related to the likelihood that supplementation programs can accelerate the recovery of naturally spawning populations, these hatchery stocks provide a safeguard against the further decline of natural-origin populations.

The Dworshak NFH is unique in the Snake River basin in producing a B-run hatchery stock. The Dworshak stock was developed from natural-origin steelhead from within the North Fork Clearwater River, is largely free of introductions from other areas, and was therefore included in the ESU although not as part of the listed population. However, past hatchery practices and possibly changes in flow and temperature conditions related to Dworshak Dam have lead to substantial divergence in spawn timing of the hatchery stock compared to what was observed historically in the North Fork Clearwater River, and compared to natural-origin populations in other parts of the Clearwater basin. Because the spawn timing of the hatchery stock is much earlier than it was historically (Figure A-6), the success of supplementation efforts using these stocks may be limited. In fact, past supplementation efforts in the South Fork Clearwater River using Dworshak NFH stock have been largely unsuccessful, although improvements in out-planting practices have the potential to yield different results. In addition, the unique genetic character of Dworshak NFH steelhead noted above will limit the degree to which the stock can be used for supplementation in other parts of the Clearwater subbasin and particularly in the Salmon River B-run basins. Supplementation efforts in those areas, if undertaken, will more likely have to rely on the future development of local broodstocks. Supplementation opportunities in many of the B-run production areas will be limited in any case because of logistical difficulties in getting to and working in these high mountain, wilderness areas. Because opportunities to accelerate the recovery of B-run steelhead through supplementation, even if successful, are expected to be limited, it is essential to maximize the escapement of natural-origin steelhead in the near term.

Finally, the conclusions and recommendations of the TAC's All Species Review are pertinent to this review of the status of Snake River steelhead. Considering information available through 1996, the 1997 All Species Review stated:

> Regardless of assessment methods for A and B steelhead, it is apparent that the primary goal of enhancing the upriver summer steelhead run is not being

achieved. The status of upriver summer steelhead, particularly natural-origin fish, has become a serious concern. Recent declines in all stocks, across all measures of abundance, are disturbing.

There has been no progress toward rebuilding upriver runs since 1987. Throughout the Columbia River basin, dam counts, weir counts, spawning surveys, and rearing densities indicate natural-origin steelhead abundance is declining, culminating in the proposed listing of upriver stocks in 1996. Escapements have reached critically low levels despite the relatively high productivity of natural and hatchery rearing environments. Improved flows and ocean conditions should increase smolt-adult survival rates for upriver summer steelhead. However, reduced returns in recent years are likely to produce fewer progeny and lead to continued low abundance.

Although steelhead escapements would have increased (in some years substantially) in the absence of mainstem fisheries, data analyzed by the TAC indicate that effects other than mainstem Columbia River fishery harvest are primarily responsible for the currently depressed status and the long term health and productivity of wild steelhead populations in the Columbia River.

Though harvest is not the primary cause of declining summer steelhead stocks, and harvest rates have been below guidelines, harvest has further reduced escapements. Prior to 1990, the aggregate of upriver summer steelhead in the mainstem Columbia River appears at times to have led to the failure to achieve escapement goals at Lower Granite Dam. Wild Group B steelhead are presently more sensitive to harvest than other salmon stocks, including the rest of the steelhead run, due to their depressed status and because they are caught at higher rates in the Zone 6 fishery.

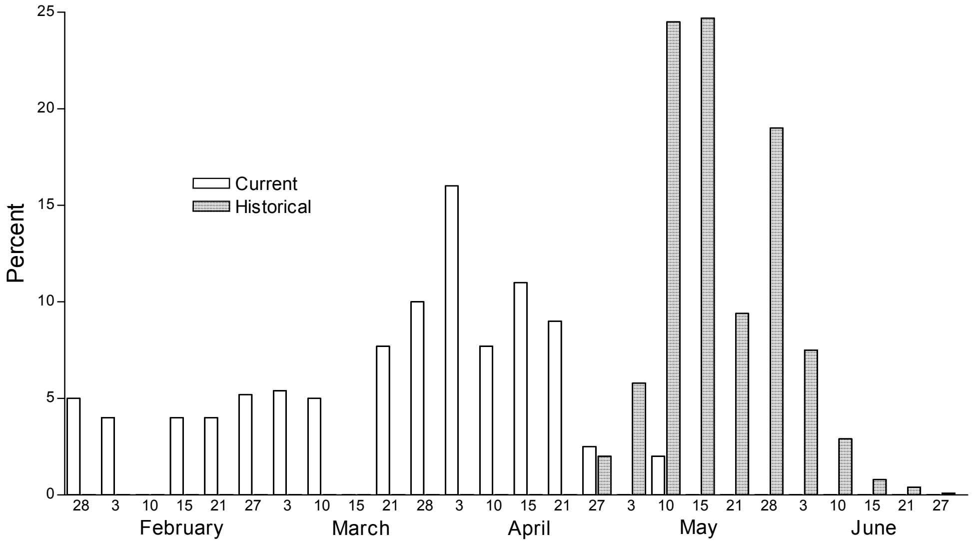
Small or isolated populations are much more susceptible to stochastic events such as drought and poor ocean conditions. Harvest can further increase the susceptibility of such populations. The Columbia River Fish Management Plan (TAC 1997) recognizes that harvest management must be responsive to run size and escapement needs to protect these populations. The parties should ensure that TAC 1997 harvest guidelines are sufficiently protective of weak stocks and hatchery broodstock requirements.

The All Species Review included the following recommendations:

- Develop alternative harvest strategies to better achieve rebuilding and allocation objectives.

- Consider modification of steelhead harvest rate guidelines relative to stock management units and escapement needs.

Figure A-6. Historical Versus Current Spawn-Timing of Steelhead at Dworshak Hatchery



For the Snake River steelhead ESU as a whole, the median population growth rate (lambda) from years1980-1997, ranges from 0.91 - 0.70, depending on the assumed number of hatchery fish reproducing in the river (Tables B-2a and B-2b in McClure et al. 2000). NOAA Fisheries estimated the risk of absolute extinction for A- and B-runs, based on assumptions of complete hatchery spawning success, and no hatchery spawning success. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), the risk of absolute extinction within 100 years is 0.01 for A-run steelhead and 0.93 for B-run fish (Table B-5 in McClure et al. 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%), the risk of absolute extinction within 100 years is 1.00 for both runs (Table B-6 in McClure et al. 2000).

NOAA Fisheries has also calculated the proportional increase in the average growth rate of each run that would be needed to reduce the risk of absolute extinction within 100 years to five percent (Tables A-2a through A-2d; Appendix B in McClure et al. 2000). Assuming that the effectiveness of hatchery fish has been zero, the needed change in the growth rate of the wild population ranges from 0.01 for A-run steelhead to 0.02 for the B run (Table A-2a). The maximum needed change in growth rate rises as high as 470% for B-run steelhead if hatchery-origin spawners have been 100% as effective as wild fish (Table A-2d).

Table A-2a. Estimated initial population size in the Dennis model analyses for individual stocks, average population growth rate (lambda), risk of absolute extinction and the proportional change in lambda needed to reduce the risk of extinction to five percent, and the risk of a 90% decline in abundance (source: Appendix B in McClure et al. 2000). This analysis incorporates the proportion of natural spawners that were of hatchery-origin but assumes that hatchery fish did not reproduce.

Species ESU	Initial Pop. Size	lambda	Risk of Extinction 24-Year	100-Year	Change in lambda	24-Year	Risk of a 90% Decline 100-Year	24-
Steelhead								
Snake River ESU								
A-run	299,161	0.91	0.00	0.12	0.000	0.010	0.42	1.00
B-run	100,455	0.92	0.00	0.35	0.000	0.020	0.38	1.00

Table A-2b. Estimated initial population size in the Dennis model analyses for individual stocks, average population growth rate (lambda), risk of absolute extinction and the proportional change in lambda needed to reduce the risk of extinction to five percent, and the risk of a 90% decline in abundance (source: Appendix B in McClure et al. 2000). This analysis incorporates the proportion of natural spawners that were of hatchery-origin but assumes that hatchery fish have been 20% as productive as spawners of wild-origin.

Species ESU	Stream	Initial Pop. Size	lambda	Risk of Extinction 24-Year	Risk of Extinction 100-Year	Change in lambda 24-Year	Change in lambda 100-Year	Risk of a 90% Decline 24-Year	Risk of a 90% Decline 100-Year
Steelhead									
Snake River ESU									
A-run		299,161	0.52	0.99	1.00	0.360	0.835	1.00	1.00
B-run		100,455	0.48	1.00	1.00	0.480	0.965	1.00	1.00

Table A-2c. Estimated initial population size in the Dennis model analyses for individual stocks, average population growth rate (lambda), risk of absolute extinction and the proportional change in lambda needed to reduce the risk of extinction to five percent, and the risk of a 90% decline in abundance (source: Appendix B in McClure et al. 2000). This analysis incorporates the proportion of natural spawners that were of hatchery-origin but assumes that hatchery fish have been 80% as productive as spawners of wild-origin.

Species	ESU	Stream	Initial Pop. Size	lambda	Risk of Extinction 24-Year	Risk of Extinction 100-Year	Change in lambda 24-Year	Change in lambda 100-Year	Risk of a 90% Decline 24-Year	Risk of a 90% Decline 100-Year
Steelhead										
	Snake River ESU									
		A-run	299,161	0.23	1.00	1.00	2.170	3.285	1.00	1.00
		B-run	100,455	0.20	1.00	1.00	2.515	3.765	1.00	1.00

Table A-2d. Estimated initial population size in the Dennis model analyses for individual stocks, average population growth rate (lambda), risk of absolute extinction and the proportional change in lambda needed to reduce the risk of extinction to five percent, and the risk of a 90% decline in abundance (source: Appendix B in McClure et al. 2000). This analysis incorporates the proportion of natural spawners that were of hatchery-origin but assumes that hatchery fish have been 100% as productive as spawners of wild-origin.

Species	ESU	Stream	Initial Pop. Size	lambda	Risk of Extinction 24-Year	Risk of Extinction 100-Year	Change in lambda 24-Year	Change in lambda 100-Year	Risk of a 90% Decline 24-Year	Risk of a 90% Decline 100-Year
Steelhead										
	Snake River ESU									
		A-run	299,161	0.19	1.00	1.00	2.765	4.100	1.00	1.00
		B-run	100,455	0.17	1.00	1.00	3.185	4.695	1.00	1.00

REFERENCES

Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)–steelhead. U.S. Fish and Wildlife Service, Biological Report 82 (11.60).

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6, Bethesda, Maryland.

Burgner, R. L., J. T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (Oncorhynchus mykiss) in offshore waters of the North Pacific Ocean. International North Pacific Fish Commission Bulletin 51.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27. August.

Everest, F. H. 1973. Ecology and management of summer steelhead in the Rogue River. Oregon State Game Commission, Fisheries Research Report 7, Corvallis.

Giger, R. D. 1973. Streamflow requirements of salmonids. Oregon Wildlife Commission, Final Report (Project AFS-62-1), Portland.

Hall-Griswold, J. A., and C. E. Petrosky. 1998. Idaho habitat/natural production monitoring. Part 1: general monitoring subproject. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Annual Report 1996 (Project 91-73), Portland, Oregon.

Hartt, A. C., and M. B. Dell. 1986. Early oceanic migrations and growth of juvenile Pacific salmon and steelhead trout. International North Pacific Fisheries Commission Bulletin 46:1-105.

Marmorek, D. R., and C. N. Peters, editors. 1998. Plan for analyzing and testing hypotheses (PATH): preliminary decision analysis report on Snake River spring/summer chinook. ESSA Technologies Ltd., Vancouver, B.C.

McClure, B. Sanderson, E. Holmes, C. Jordan, P. Kareiva, and P. Levin. 2000. Revised Appendix B of standardized quantitative analysis of the risks faced by salmonids in the Columbia River basin. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington. September.

McElhany, P., M. Ruckelshaus, M. J. Ford, T. Wainwright, and E. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. National Marine Fisheries Service, Northwest Fisheries Science Center, Draft Report, Seattle, Washington. January 6.

Mealy, S. P. 1997. Letter re: State of Idaho's comments on the proposed listing of Snake River steelhead for protection under the Federal Endangered Species Act. Idaho Department of Fish and Game. February 11.

Meehan, W. R., and T. C. Bjornn. 1991. Salmonid distributions and life histories. Pages 47-82 *in* W. R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, Maryland.

Nickelson, T. E., J. W. Nicholas, A. M. McGie, R. B. Lindsay, D. L. Bottom, R. J. Kaiser, and S. E. Jacobs. 1992. Status of anadromous salmonids in Oregon coastal basins. Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, and Ocean Salmon Management, Newport, Oregon.

NMFS (National Marine Fisheries Service). 1999. Biological opinion on artificial propagation in the Columbia River basin—incidental take of listed salmon and steelhead from Federal and non-Federal hatchery programs that collect, rear, and release unlisted fish species. NMFS, Endangered Species Act Section 7 consultation. March 29.

TAC (Technical Advisory Committee). 1997. All species review, 1996—summer steelhead: Columbia River fish management plan. TAC for U.S. v. Oregon. August 4 (tables 8-11 updated).

TAC (Technical Advisory Committee). 1999. Minutes of meeting May 4-5, 1999. TAC for U.S. v. Oregon.

Waples, R. S., O. W. Johnson, P. B. Aebersold, C. K. Shiflett, D. M. VanDoornik, D. J. Teel, and A. E. Cook. 1993. A genetic monitoring and evaluation program for supplemented populations of salmon and steelhead in the Snake River Basin. Report to the U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, contract DE-A179-89BP00911.

Withler, I. L. 1966. Variability in life history characteristics of steelhead trout (Salmo gairdneri) along the Pacific coast of North America. Journal of the Fisheries Research Board of Canada 23:365-393.